REMARKS

Pending claims

Claims 1-11 and 14 are still pending, although claims 7-10 were withdrawn in response to the previous restriction requirement. The applicant reserves the right to pursue these claims in a future divisional application.

Objections to the Drawings

The Examiner objected to the drawings on the grounds that they did not illustrate the features – relating to temperature measurement and compensation – recited in claims 12 and 13. Claims 12 and 13 have been canceled. The drawings now show all features recited in the remaining claims under examination that relate to the arrangement according to the invention as opposed to the method of operation.

Objections to the Specification

The Examiner objected to the specification for failing to provide proper antecedent basis for the features recited in claims 12 and 13. The applicant respectfully points out that paragraph [0030] does state that circuitry may be included in the drive and measurement circuitry 7 to carry out the intended temperature-related functions. Claims 12 and 13 have nonetheless been canceled in the interest of furthering successful, speedy prosecution of this application.

Claim Rejections – Nippert

The Examiner rejected all the pending claims under either 35 USC §102 (claims 1-3, 11, and 14) or §103 (claims 4-6, 12, and 13, relating to temperature measurement, compensation, etc.), as being unpatentable over *Nippert* (US 5,600,237).

In *Nippert's* solenoid, the current used to drive the actuator, and to measure position, is applied to the static coil, not to the moveable armature. For example:

Col. 4, lines 49-56:

> The solenoid 14 includes a coil 16 and an armature 18 that is movable with respect to the coil 16. In one embodiment, the armature is linearly actuatable in response to the magnitude of current flowing in the coil 16, such as a linear solenoid. In an alternative embodiment, the armature is pivotally actuatable in response to the magnitude of current flowing in the coil 16, such as a rotary solenoid.

and

Col. 4, lines 61-67:

> The magnitude of current flowing in the coil is determined 56 by measuring the voltage across the shunt resistor 20. The signal representing the magnitude of coil current is differentiated 58. The signal representing the magnitude of coil current is also multiplied 60 by a value representative of the internal resistance of the coil 14.

In contrast, in the applicant's amended independent claims, it is made clear (in the body of the claim as opposed to simply in the preamble), that it is the coil that is moveable relative to the core, and that the AC signal is applied to the moveable coil. In other words, in the applicant's invention as claimed, the electrical signal used to sense position is applied to the moveable member (the coil in the applicant's invention but the armature 18 in *Nippert*), not to the fixed member.

This is not a simple design choice. As the applicant explains in the very beginning of his application (emphasis added):

> **[0003]** It is known that one can measure the position of an electromagnetic actuator, *in which the moving part comprises an iron core arranged so as to be influenced by the magnetic field generated by a stationary coil*, by analyzing the inductance of the coil. One example of this method is shown in U.S. Patent 5,172,298. An unavoidable disadvantage of this method is that the relative variation of inductance is low, which causes the absolute accuracy to be low as well. This is clearly a disadvantage if high precision is desired. In US5,172,298 it is also suggested that the coil may be divided into a driving coil and a measuring coil. This is an additional disadvantage, in that this leads to increased complexity.

Although significant, this is not the only disadvantage of an arrangement such as *Nippert's*. By their very nature, actuators built around an iron armature within an iron core will have a coil inductance that will always be higher than what is found in a voice-coil

arrangement such as in this invention. This in turn means either that the signal exchange at any given frequency will in general be much better in the applicant's voice-coil arrangement, or that the measurement frequency will be much lower in an arrangement such as *Nippert's*.

Nippert therefore not only teaches the opposite of the applicant's arrangement, but is also an illustration of the very type of actuator arrangement the applicant's invention is intended to improve upon. *Nippert's* arrangement will suffer from the disadvantages mentioned above and in the applicant's specification; the applicant's will not.

The independent claims as amended now recite a feature of the invention that is not only not found in *Nippert*, but that is the opposite of *Nippert's* disclosed structure. This claimed feature provides performance advantages that *Nippert* cannot achieve. Consequently, the applicant respectfully submits that independent claims 1 and 11 define the invention in a manner that both novel and non-obvious in comparison with the cited prior art. Of course the remaining claims, being dependent, further limit the invention; these claims should be allowable along with their respective independent base claims.

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Respectfully submitted,

Jeffrey Pearce

34825 Sultan-Startup Rd.
Sultan, WA 98294
Phone & fax: (360) 793-6687

Jeffrey Pearce
Reg. No. 34,729
Attorney for the Applicant(s)